

- Suba*
1. A ligament graft fixation system for fixing ligament graft material within a bone tunnel comprising:
- an expandable fixation member having opposed bone engaging elements disposed about its periphery, the fixation member having a proximal end, a distal end and an expansion plug receiving opening defined in the proximal end, at least one plug retaining element provided in the expansion plug receiving opening;
- a graft receiving eyelet disposed proximate the distal end of the expandable fixation element; and
- an expansion plug having a diameter greater than a diameter of the expansion plug receiving opening and having an engaging element matable with the plug retaining element wherein forceable insertion of the expansion plug into the expansion plug receiving opening causes an expansion of the expandable fixation member driving the opposed bone engaging elements apart so as to fix the bone engaging elements in a bone tunnel.
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2. The ligament graft fixation system of claim 1, wherein at least one expansion slot is formed in a side wall of the expandable fixation member, the expansion slot adapted to direct expansion of the expandable fixation member in a direction so as to drive the opposed bone engaging elements apart.
3. The ligament graft fixation system of claim 2, wherein at least two expansion slots are provided.
4. The ligament graft fixation system of claim 3, wherein the at least two expansion slots are provided asymmetrically about the periphery of the expandable fixation member.
5. The ligament graft fixation system of claim 1, wherein the expandable fixation member includes two graft location grooves, each groove extending distally from one side of the graft receiving eyelet.
6. The ligament graft fixation system of claim 5, wherein the grooves are asymmetrically located to allow for anterior or posterior graft fixation.

7. The ligament graft fixation system of claim 1, wherein the at least one plug retaining element is a female thread formed about the expansion plug receiving opening.
- 5 8. The ligament graft fixation system of claim 7, wherein the engaging element is a male thread disposed about a periphery of the expansion plug, the male thread having a pitch approximately equal to a pitch on the female thread formed about the expansion plug receiving opening so that upon forceable insertion of the expansion plug into the expansion plug receiving opening the male and female threads engage to hold the expansion plug within 10 the expansion plug receiving opening.
- 15 9. The ligament graft fixation system of claim 1, wherein the expansion plug is cannulated and a pull rod engaging element is disposed on a distal end of the expansion plug receiving opening, the ligament graft fixation system further comprising a pull rod extending through the cannulated expansion plug and the expansion plug receiving opening and engaging the pull rod engaging element.
- 20 10. The ligament graft fixation system of claim 9, wherein a cannulated push tube extends over the pull rod and abuts a distal end of the expansion plug.
- 25 11. The ligament graft fixation system of claim 10, further comprising an actuation element engaged to the pull rod and the push tube, the actuation element providing relative movement between the pull rod and push tube to forceably insert the expansion plug into the expandable fixation member.
- 30 12. The ligament graft fixation system of claim 1, wherein the graft receiving eyelet is provided on a tip having a proximal expansion plug and the fixation member defines a distal plug receiving opening, the proximal expansion plug sized so that, upon forceable insertion of the proximal expansion plug into the distal plug receiving opening, a distal portion of the expanding fixation member expands for fixing to a bone tunnel.

13. The ligament graft fixation system of claim 12, wherein the expanding fixation element has at least one proximal expansion slot guiding expansion of a proximal portion of the expanding fixation member upon forceable insertion of the expansion plug and at least one distal expansion slot guiding expansion of a proximal portion of the expanding fixation member upon forceable insertion of the proximal expansion plug.
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14. The ligament graft fixation system of claim 13, wherein the at least one proximal expansion slot guides expansion of a proximal portion of the expanding fixation member in a first direction and the at least one distal expansion slot guides expansion of a distal portion of the expanding fixation member in a second direction different from the first direction.
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15. The ligament graft fixation system of claim 14, wherein the at least one distal expansion slot guides expansion of a distal portion of the expanding fixation member to drive the opposed bone engaging members apart to fix the expanding fixation member in a bone tunnel.
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16. The ligament graft fixation system of claim 15, wherein the at least one proximal expansion slot guides expansion of a proximal portion in a direction for pressing a graft material against a bone tunnel wall.
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17. The ligament graft fixation system of claim 14, wherein the proximal expansion plug sized so that, upon forceable compression of the expansion plug, expanding fixation member, and proximal plug, the proximal expansion plug is admitted into the distal plug receiving opening before the expansion plug is admitted into the proximal plug receiving opening.
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18. The ligament graft fixation system of claim 12, wherein the expansion plug and the expanding fixation member are cannulated and a pull rod engaging element is disposed on a proximal end of the proximal plug, the ligament graft fixation system further comprising a pull rod extending through the cannulated expansion plug and expanding fixation member and engaging the pull rod engaging element.
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19. The ligament graft fixation system of claim 18, wherein a cannulated push tube extends over the pull rod and abuts a distal end of the expansion plug.
20. The ligament graft fixation system of claim 19, further comprising an actuation element engaged to the pull rod and the push tube, the actuation element providing relative movement between the pull rod and push tube to forceably insert the proximal plug and the expansion plug into the expandable fixation member.
21. A method for fixing a ligament graft in a bone tunnel comprising the steps of:
- 10 forming a bone tunnel, the bone tunnel having a proximal edge;
- providing a ligament graft fixation system comprising:
- 15 an expandable fixation member having opposed bone engaging elements about its periphery, the fixation member having a proximal end, a distal end and an expansion plug receiving opening defined in the proximal end, at least one plug retaining element provided in the expansion plug receiving opening;
- 20 a graft receiving eyelet disposed proximate the distal end of the expandable fixation element; and
- 25 an expansion plug having a diameter greater than a diameter of the expansion plug receiving opening and having an engaging element matable with the plug retaining element wherein forceable insertion of the expansion plug into the expansion plug receiving opening causes an expansion of the expandable fixation member driving the opposed bone engaging elements apart so as to fix the bone engaging elements in a bone tunnel;
- looping a ligament graft through the eyelet;
- inserting the ligament graft fixation system and ligament graft into the bone tunnel until the proximal end of the expanding graft fixation member is even with or slightly inside the edge of the bone tunnel;

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forceably inserting the expansion plug into the expanding fixation member to expand the expanding fixation member and thereby fix the expanding fixation member and ligament graft within the bone tunnel proximate to the bone tunnel edge.

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